

REMARKS

Claims 1-32 and 24-26 are presenting pending in the application. Claims 19, 24, and 25 have been amended to clarify certain aspects of these claims.

In the Office Action mailed July 15, 2004, claims 1-22 and 24-26 were rejected. More specifically, the status of the application in light of this Office Action is as follows:

- (A) Claim 25 stands rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent Publication No. 2002/0193685 to Mate et al. ("Mate");
- (B) Claims 19, 24, and 25 stand rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,400,338 to Mejia et al. ("Mejia");
- (C) Claims 1-3 and 12 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 3,836,842 to Zimmermann et al. ("Zimmermann");
- (D) Claims 4-9, 10, 11, 13, 14, and 15-18 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over various combinations of Zimmermann, Mejia, U.S. Patent No. 5,211,129 to Taylor et al. ("Taylor"), and U.S. Patent No. 6,441,741 to Yoakum ("Yoakum");
- (E) Claims 20 and 26 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Mejia;
- (F) Claim 21 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Mejia in view of Yoakum; and
- (G) Claim 22 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Yoakum in view of Taylor or Mejia.

A. Response to Section 102 Rejection of Claim 25 (Mate)

Independent claim 25 was rejected under 35 U.S.C. § 102(e) as being anticipated by Mate. The rejection of claim 25 over Mate should be withdrawn because this reference does not qualify as prior art under Section 102(e) relative to the subject

matter of claim 25. The enclosed Declaration of Steven C. Dimmer under 37 C.F.R. § 1.132 establishes that Mr. Dimmer conceived of or invented the subject matter of claim 25 that is disclosed in the cited reference. The rejection of claim 25 over Mate under § 102(e) should accordingly be withdrawn.

B. Response to Section 102 Rejection of Claims 19, 24, and 25 (Mejia)

Independent claims 19, 24, and 25 were rejected under 35 U.S.C. § 102(e) as being anticipated by Mejia. As discussed below, however, claims 19, 24, and 25 are patentable over Mejia because this reference fails to disclose several features of these claims.

1. Independent Claim 19 is Directed to a Miniature Resonating Marker Assembly Having a Core with a First Cap Having a First Thickness and a Second Cap Having a Second Thickness

Independent claim 19 is directed to a miniature resonating marker assembly. The miniature resonating marker assembly includes a core with an elongated central portion and two enlarged caps attached to the central portion. The first cap has an axial thickness different than the axial thickness of the second cap. A wire coil is disposed around the central portion of the core between the first and second caps, and a capacitor is connected to the coil adjacent to the core to form a signal element tuned to a selected resonant frequency. The first cap is movable relative to the coil and capacitor to tune the marker assembly to have a selected inductance value.

2. Mejia Discloses a Passive Integrated Transponder Tag Including a Unitary Antenna Core

Mejia teaches a passive integrated transponder (PIT) tag for implantation in laboratory animals, pets, or livestock. Referring to Figures 8-10, Mejia discloses a PIT tag 10 having a unitary core 12 extending substantially the entire length of the tag 10 and an encapsulation means 34 encasing the core 12. The core 12 includes a coil forming portion 16 at one end of the core and an integrated circuit (IC) support portion 18 at the other end of the core. The coil forming portion 16 includes a center portion 36 having beveled ends 40 leading to end portions 42. Wire is wound around the center portion 36 of the coil forming portion 16 to form a coil 20. The IC support portion 18 is a

flattened plane that extends beneath and supports an integrated circuit 14 and a capacitor 28. The IC support portion 18 can further include metallization layers 26 to electrically couple the coil 20 to the integrated circuit 14 and capacitor 28. The capacitor 28 is an optional component that may be eliminated, as a matter of design choice, depending on the particular integrated circuit 14 used in a given PIT tag.

3. Claim 19 is Patentable Over Mejia Because the Applied Reference Fails to Disclose or Suggest Several Features of this Claim

Claim 19 is patentable over Mejia because this reference fails to disclose or suggest several features of the claim. For example, claim 19 includes "a first cap being movable relative to the coil and capacitor for tuning the marker assembly to a selected resonant frequency." In contrast, Mejia teaches a unitary core 12 having a coil forming portion 16 and an IC support portion 18. The core 12 in Mejia is not movable relative to the coil 20 or the capacitor 28, and the core 12 does not appear to have any moveable components. Accordingly, Mejia does not disclose at least one element of claim 19 and the rejection should be withdrawn.

Claim 24 is also patentable over Mejia under Section 102 because this reference fails to teach or suggest several features of this claim. Claim 24, for example, recites "an axially adjustable segment at the second end of the core that projects outwardly with respect to the longitudinal axis of the core." At best, Mejia includes a very small fixed end portion 42 at an end of the core 12 that projects outwardly with respect to the longitudinal axis of the core 12. Mejia does not teach or suggest that the end portion 42 is "axially adjustable," but rather Mejia teaches that the end portion 42 is fixed to or even integral with the coil forming portion 16 of its core 12. Furthermore, as discussed below, it would not be obvious to modify Mejia to include this feature. Claim 24 is accordingly patentable over Mejia.

Claim 25 is also patentable over Mejia because this reference fails to teach a core having a central portion with "a first magnetic permeability" and enlarged endcaps with "a second magnetic permeability different than the first magnetic permeability." In contrast, the Office Action correctly notes that "Mejia discloses a unitary antenna core

12 (including coil forming portion 16 and IC support portion 18 [formed of] the same ferrite material." (Office Action, p. 6.) The end portions 42 also appear to be made of the same material as the coil forming portion 16. It follows that the coil forming portion 16 and the IC support 18 of Mejia have the same magnetic permeability. Accordingly, the Section 102 rejection of claim 25 should also be withdrawn.

C. Response to Section 103 Rejection of Claims 1-3 and 12 (Zimmermann)

Claims 1-3 and 12 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Zimmermann. For the reasons explained below, the applicants respectfully submit that this rejection is not proper because (a) the cited reference does not disclose or suggest all of the claimed features, and (b) a person skilled in the art would not be motivated to modify Zimmermann's marking devices for markers used in human patients.

1. Independent Claim 1 is Directed to a Miniature Resonating Marker Assembly Including, *Inter Alia*, a Signal Element Having a Core, a Wire Coil Around the Core, a Capacitor Connected to the Wire Coil, and an Inert Encapsulation Member Encapsulating the Signal Element

Independent claim 1 is directed to a miniature resonating marker assembly. The miniature resonating marker assembly includes a core, a wire coil disposed around the core, and a capacitor connected to the wire coil adjacent to the magnetic core. The core, coil, and capacitor form a signal element that generates a magnetic field at a selected resonating frequency in response to a wirelessly transmitted source field. The magnetic field has a magnetic center point positioned along a first axis of the core. An inert encapsulation member encapsulates the signal element and defines a geometric shape of the resonating marker assembly. The geometric shape has a geometric center point substantially coincident with the magnetic center point along at least a first axis of the signal element. Accordingly, when a user locates the marker assembly's magnetic center point, the user will have also located the marker assembly's geometric center point. Conversely, when a user locates the marker assembly's geometric center, the user will have also located the marker assembly's magnetic center point.

2. Zimmermann is Directed to a Passive Marking Device for Placement in a Location Such that the Location is Thereafter Identifiable with a Suitable Interrogating Instrument

Zimmermann discloses a passive marking device for marking a location underground and a suitable interrogating instrument used to find the buried marking device. Referring to Figures 1a-1c, the marking device 1 includes a coil of insulated conductor wire 4 placed on an elongated ferrite core 5. A capacitor 6 is connected in parallel with the coil 4. The core 5 is 1 cm in diameter and 20 cm in length. (Zimmermann, col. 6, Ins. 3-4.) The marking device 1 also includes a rigid encapsulation 3 formed from a thermosetting epoxy material that will break or shatter along with the core 5 if the marking device 1 is subjected to a mechanical shock. (Zimmermann, col. 6, Ins. 24-29.) As seen in Figure 6, the interrogating instrument 100 includes (a) a generating portion that generates a continuous wave magnetic field, and (b) a detecting portion that detects a fluctuating magnetic field. The presence of the marking device is indicated when the interrogating instrument detects the magnetic field resulting from the resonance of the marking device during interruptions in the field from the generating portion.

3. Claim 1 is Allowable over Zimmermann Because this Reference Does Not Teach or Suggest all of the Claimed Features and is Fundamentally Flawed for Use with Very Small Transmitters in Human Patients

Claim 1 is patentable over Zimmermann under Section 103 because this reference fails to teach or suggest several claimed features. Claim 1, for example, recites that the marker assembly includes a magnetic center point positioned along the first axis of the core and a geometric center point substantially coincident with the magnetic center point. The Office Action asserts that "[a]lthough Zimmermann does not specifically spell out that the geometric center [is] coincident with the magnetic center along at least the first axis of the core, it appears that Zimmermann in Fig. 1b shows such [a] limitation." This is not correct. Referring to Figure 1b of Zimmermann, the marking device has a geometric center at approximately a center portion of the device. The magnetic center of Zimmermann's device, however, is not coincident with the geometric center. More specifically, the capacitor 6 in Zimmerman is spaced apart

from the core 5 and the coil 4 in a manner that shifts the magnetic center of the transponder in Zimmermann axially along the length of the core. The position of the relevant electrical components in Zimmermann (i.e., the coil 4, core 5, and capacitor 6) are also fixed with respect to one another within the encapsulant 3 such that the magnetic center cannot be moved to be coincident with the geometric center. Furthermore, one skilled in the art would not be motivated to modify Zimmermann's device to align the geometric and magnetic centers because Zimmermann's device, in use, does not teach or require such precision. Thus, there is no need or motivation to align the magnetic and geometric centers of Zimmermann's device. Therefore, the Section 103 rejection of claim 1 should be withdrawn.

Claim 1 is further patentable over Zimmermann under Section 103 because a person skilled in the art would not be motivated to modify or otherwise use Zimmermann's passive marking device for use in human patients. Zimmermann is fundamentally flawed for use with very small transmitters in human patients. More specifically, although Zimmermann teaches a system for locating an object using a magnetic field, a person skilled in the art would have recognized the difficulties in miniaturizing Zimmerman's marker for use in a human to perform medical procedures. The field strength of an alternating current magnetic transponder is, in part, a function of the number of windings in the coil and the size and material of the core. The field strength for a marking device having a diameter as claimed would be extremely small and difficult to distinguish. This gives rise to several problems not faced by miniaturizing the very large marker of Zimmerman. First, to induce enough voltage in the circuit of such a small marking device, the interrogating instrument must generate a magnetic field several orders of magnitude larger than that of the marking device's field. Second, such large source fields drown out the signal from the small markers. Third, even if the marker signal is detected, it is so small that it is subject to noise in the field. Zimmerman does not face these challenges, and Zimmerman also does not have the concerns of implanting a marker in a human. Moreover, Zimmermann teaches that the interrogating instrument generates a continuously magnetic wave which would likely interfere with the signal from a marker configured to be implanted in a patient. As a

result, the location of small implantable marking devices computed by Zimmermann's system would be unreliable and subject to errors. A person skilled in the art would thus be deterred from reducing the size of Zimmermann's device to the claimed size of the marking assembly. Claim 1 is accordingly patentable over Zimmermann under Section 103 for this additional reason because it would not have been obvious at the time of the invention to modify the passive marking device of Zimmermann to be contained within a miniature biocompatible body to be implanted into a human patient.

Claims 2, 3, and 12 are allowable as depending from allowable base claim 1, and also because of the additional features of these dependent claims. Accordingly, the Section 103 rejection of claims 2, 3, and 12 should be withdrawn.

D. Response to Section 103 Rejection of Claims 4-9, 10, 11, 13, 14, and 15-18 (Zimmermann, Mejia, Taylor, Yoakum)

Claims 4-9, 10, 11, 13, 14, and 15-18 were rejected under 35 U.S.C. § 103(a) as being unpatentable over various combinations of Zimmermann, Mejia, Taylor, and/or Yoakum. Claims 4-9, 10, 11, 13, 14, and 15-18 depend from base claim 1. Mejia, Taylor, and Yoakum fail to cure the above-noted deficiencies of Zimmermann to support a rejection of claim 1. Accordingly, dependent claims 4-9, 10, 11, 13, 14, and 15-18 are allowable over Zimmermann, Mejia, Taylor, and Yoakum as depending from allowable base claim 1, and also because of the additional features of these dependent claims. Therefore, the Section 103 rejection of dependent claims 4-9, 10, 11, 13, 14, and 15-18 should be withdrawn.

E. Response to Section 103 Rejection of Claims 20 and 26 (Mejia)

Claims 20 and 26 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Mejia. For the reasons explained below, this rejection is not proper because the cited reference does not disclose or suggest all of the claimed features.

1. Claim 20 is Directed to a Miniature Resonating Marker Assembly Having a Geometric Center Coincident with the Assembly's Magnetic Center

Independent claim 20 is directed to a miniature resonating marker assembly including a ferromagnetic core having an elongated central portion and first and second ferromagnetic endcaps at opposite ends of the central portion. The core is substantially symmetrical about a longitudinal axis of the core, but it is asymmetrical about a lateral axis of the core. A wire coil is disposed around the central portion of the core between the first and second endcaps, and a capacitor is connected to the wire coil. The core, coil, and capacitor form a signal element that, when energized, generates a magnetic field at a selected resonating frequency. The magnetic field has a magnetic center point positioned along a first axis coincident with the geometric center of the resonating marker assembly.

2. Claim 20 is Allowable Over Mejia Because this Reference Fails to Teach or Suggest a Magnetic Center Point Coincident with a Geometric Center Point

Claim 20 is patentable over Mejia under Section 103 because this reference fails to teach or suggest a magnetic center point coincident with the device's geometric center point. To the contrary, the magnetic center point of Mejia's device is not even close to its geometric center point. The Office Action correctly asserts that "because the material of core 12 (including coil-forming portion 16 and IC support portion 18) is the same in all portions (i.e., ferrite), the magnetic center would be spaced from the coil center and shifted to the right of the drawings (see Fig. 9A) . . ." (Office Action, p. 10.) The Office Action, however, incorrectly states that "it is possible that the magnetic center is coincident with the geometric center of the resonating marker along a first axis." (Id.) These two statements are inconsistent. The Office Action admits that the magnetic center is not at the geometric center of Mejia's PIT tag, and then tries to assert that it may be possible for the magnetic center and geometric center of the PIT tag to be coincident. Mejia does not teach or suggest this claimed feature and a person skilled in the art would not be motivated to modify the structure of Mejia's PIT tag such that the geometric and magnetic centers of the device were coincident. In fact, the

unitary core 12 of Mejia does not allow for any adjustment of the magnetic center point. Accordingly, the Section 103 rejection of claim 20 should be withdrawn.

3. Claim 26 is Directed to a Miniature Resonating Marker Assembly Including, *Inter Alia*, a Capacitor Having an Aperture Therethrough

Independent claim 26 is directed to a miniature resonating marker assembly including an elongated ferromagnetic core, a wire coil connected to the capacitor, and a capacitor having an aperture therethrough. The core extends through the aperture in the capacitor and the coil includes a first portion around the core on one side of the capacitor and a second portion around the core on the other side of the capacitor. An inert encapsulation member encapsulates the capacitor, coil, and core.

4. Claim 26 is Allowable Over Mejia Because this Reference Fails to Teach or Suggest a Capacitor Having an Aperture

Claim 26 is also patentable over Mejia under Section 103 because this reference fails to teach or suggest a capacitor having an aperture therethrough. The Office Action asserts that Mejia differs from the claimed invention "in that it does not disclose the specific arrangement/position of the capacitor, core and coil. However such specification is merely a matter of design choice on packaging and therefore an obvious modification to the assembly of Mejia." (Office Action, p. 8-9.) One of the primary inventive aspects of Mejia, however, is the specific arrangement of the coil forming portion 16 and the IC support portion 18. For example, Mejia teaches that the PIT tag "may be able to sustain more shock and vibration than conventional PIT tags because the integrated circuit support portion 18 physically supports the integrated circuit 14 and/or capacitor 28." (Mejia, col. 7, Ins. 42-46.)

In contrast to Mejia, claim 26 teaches that the capacitor has an aperture therethrough and that the core extends through the aperture in the capacitor such that the first portion of the wire coil is on one side of the capacitor and the second portion of the coil is on the other side of the capacitor. It would be impracticable to modify the PIT tag of Mejia in accordance with the claimed arrangement and would destroy one of

Mejia's primary inventive aspects. Accordingly, Mejia teaches away from the features of claim 26 and, therefore, the Section 103 rejection of claim 26 should be withdrawn.

F. Response to Section 103 Rejection of Claim 21 (Mejia and Yoakum)

Claim 21 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Mejia in view of Yoakum. The Office Action asserts that it would have been obvious to modify the PIT tag of Mejia in light of Yoakum to make "one endcap adjustable for positioning the coil over the core to tune the marker to the specific resonant frequency." (Office Action, p. 9.) Claim 21 is patentable over Mejia and Yoakum under Section 103 because, as discussed above, modifying the unitary core 12 of Mejia in such a way would obviate one of the primary inventive aspects of Mejia. Further, Yoakum fails to cure the above-noted deficiencies of Mejia or provide sufficient motivation to modify Mejia's device. Accordingly, the Section 103 rejection of claim 21 should be withdrawn.

G. Response to Section 103 Rejection of Claim 22 (Yoakum and Taylor or Mejia)

Claim 22 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Yoakum in view of Taylor or Mejia. The Office Action asserts that "it would have been obvious . . . to modify the core of Yoakum to include endcaps as taught by Taylor and Mejia so that the coil with the sleeve is securely positioned over the core." (Office Action, p. 10.)

1. Claim 22 is Directed to a Miniature Resonating Marker Assembly Including, *Inter Alia*, an Elongated Plastic Sleeve with a Wire Coil Disposed on the Sleeve

Independent claim 22 is directed to a miniature resonating marker assembly having an elongated plastic sleeve with a wire coil disposed on the sleeve. A central portion of a ferromagnetic core extends through the sleeve and a pair of endcaps are connected to the central portion of the core so that the sleeve is positioned between the endcaps. A capacitor is operatively connected to the wire coil and positioned adjacent to the ferromagnetic core to form a signal element tunable to resonate at a selected frequency. The core is axially movable relative to the sleeve and the coil for tuning the marker assembly to have a selected inductance value.

2. Yoakum is Directed to a Transponder Over-Molded with an Injection Molding Material

Referring to Figures 1 and 2, Yoakum discloses a transponder 10 having an integrated circuit 12 mounted on a circuit board 14 with a capacitor 16. The integrated circuit 12 and capacitor 16 are electrically coupled to a wire 18 formed into a coil 20. The coil 20 is wrapped around a bobbin 26 and then positioned over a core 30. The circuit board 14 is affixed to an end of the core 30. Yoakum teaches that "a tuned transponder assembly 10 can be fabricated by moving the coil 20 axially along the long axis of the ferrite core 30 until a tuned inductor/capacitor system is established and then securing the bobbin 26 with coil 20 to the ferrite core 30 during the manufacturing process." (Yoakum, col. 4, Ins. 53-57.) Referring to Figures 3-7, the transponder 10 is then positioned within a molding tool 40 and over-molded with a plastic, polymeric, or epoxy injection molding material 32.

3. Claim 22 is Allowable Over the Applied References Because One Skilled in the Art Would Not Modify Yoakum's Transponder to Include Endcaps

Claim 22 is allowable over the applied references because it would not have been obvious to modify Yoakum's transponder to include endcaps. As explained above, Yoakum teaches that a circuit board 14 having an integrated circuit 12 and capacitor 16 is mounted on one end of the core 30. Thus, the claimed pair of endcaps connected to the central portion of the core would conflict with the desired arrangement of Yoakum's device. Furthermore, one of the primary inventive aspects of Yoakum is the use of the molding tool 40 to encapsulate the transponder. The endcaps would interfere with the placement of the transponder in Yoakum's molding tool and thus hinder one of the primary teachings of Yoakum. Accordingly, the Section 103 rejection of claim 22 should be withdrawn.

Conclusion

In view of the foregoing, the pending claims comply with 35 U.S.C. § 112 and are patentable over the applied art. The applicant respectfully requests reconsideration of the application and a mailing of a Notice of Allowance. If the Examiner has any

questions or believes a telephone conference would expedite prosecution of this application, the Examiner is encouraged to call the undersigned at (206) 359-3982.

Respectfully submitted,

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